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ABSTRACT

A transistor operated by changing the electrostatic potential of an island disposed between two tunnel junctions. The transistor has an island of material which has a band gap (e.g. semiconductor material). Source and drain contacts are provided. The transistor has a first tunnel junction barrier disposed between island and source, and a second tunnel junction barrier disposed between island and drain. The island is Ohmically isolated from other parts of the transistor as well as a substrate. A gate electrode is capacitively coupled to the island so that a voltage applied to the gate can change the potential of the island. The transistor has n- and p-type embodiments. In operation, applying a gate voltage lowers (e.g., for positive gate bias) or raises (e.g., for negative gate bias) the conduction band and valence band of the island. When the conduction band or valence band aligns with the Fermi energy of the source and drain, tunneling current can pass between the source, island and drain.

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